BHAVAN'S BOOK UNIVERSITY
Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)

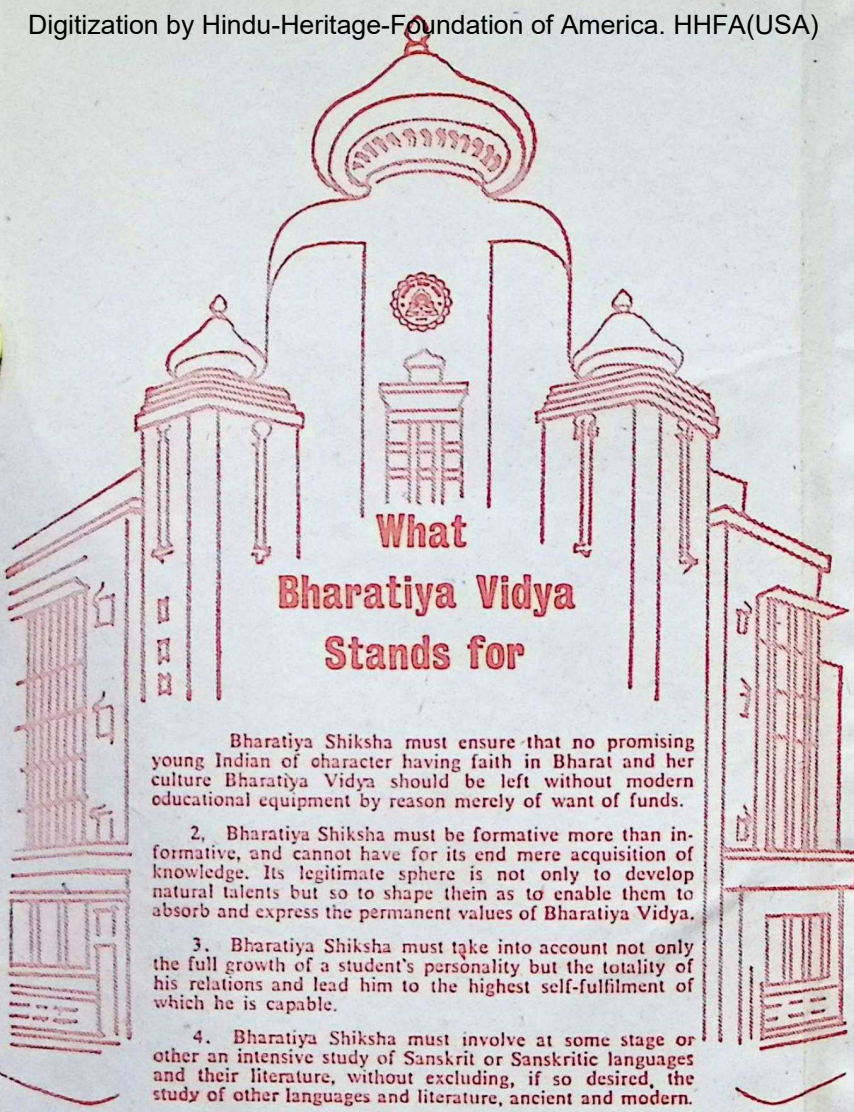
THE NEW VISION OF REALITY

A SYNTHESIS OF EASTERN WISDOM AND WESTERN SCIENCE

by Dr. Fritjof Capra

BHARATIYA VIDYA BHAVAN, BOMBAY 400 007.

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)



What Bharatiya Vidya Stands for

Bharatiya Shiksha must ensure that no promising young Indian of character having faith in Bharat and her culture Bharatiya Vidya should be left without modern educational equipment by reason merely of want of funds.

2. Bharatiya Shiksha must be formative more than informative, and cannot have for its end mere acquisition of knowledge. Its legitimate sphere is not only to develop natural talents but so to shape thein as to enable them to absorb and express the permanent values of Bharatiya Vidya.

3. Bharatiya Shiksha must take into account not only the full growth of a student's personality but the totality of his relations and lead him to the highest self-fulfilment of which he is capable.

4. Bharatiya Shiksha must involve at some stage or other an intensive study of Sanskrit or Sanskritic languages and their literature, without excluding, if so desired, the study of other languages and literature, ancient and modern.

igitization by Hindu-Heritage-Foundation of America. HHFA(USA

5. The re-integration of Bharatiya Vidya, which is the primary object of Bharatiya Shiksha, can only be attained through a study of forces, movements, motives, ideas, forms and art of creative life-energy through which it has expressed itself in different ages as a single continuous process.

6. Bharatiya Shiksha must stimulate the student's power of expression, both written and oral, at every stage in accordance with the highest ideals attained by the great literary masters in the intellectual and moral spheres.

7. The technique of Bharatiya Shiksha must involve—

(a) the adoption by the teacher of the *Guru* attitude which consists in taking a personal interest in the student; inspiring and encouraging him to achieve distinction in his studies; entering into his life with a view to form ideals and remove psychological obstacles; and creating in him a spirit of consecration; and

(b) the adoption by the student of the *Sishya* attitude by the development of—

(i) respect for the teacher,

(ii) a spirit of inquiry,

(iii) a spirit of service towards the teacher, the institution, Bharat and Bharatiya Vidya.

8. The ultimate aim of Bharatiya Shiksha is to teach the younger generation to appreciate and live up to the permanent values of Bharatiya Vidya which is flowing from the supreme art of creative life-energy as represented by Shri Ramachandra, Shri Krishna, Vyasa, Buddha and Mahavira have expressed themselves in modern times in the life of Shri Ramakrishna Paramahamsa, Swami Dayananda Saraswati, and Swami Vivekananda, Shri Aurobindo and Mahatma Gandhi.

9. Bharatiya Shiksha while equipping the student with every kind of scientific and technical training must teach the student, not to sacrifice an ancient form or attitude to an unreasoning passion for change; not to retain a form or attitude which in the light of modern times can be replaced by another form of attitude which is a truer and more effective expression of the spirit of Bharatiya Vidya; and to capture the spirit afresh for each generation to present it to the world.

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)

आ नो भद्राः क्रतवो यन्तु विश्वतः ।

Let noble thoughts come to us from every side

—Rigveda, I. 89.

BHAVAN'S BOOK UNIVERSITY

General Editors:

R. R. DIWAKAR

S. RAMAKRISHNAN

257

THE NEW VISION OF REALITY—

A Synthesis of Eastern Wisdom and Western Science

By

Dr. FRITJOF CAPRA

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)

BHAVAN'S BOOK UNIVERSITY

The New Vision of Reality

A Synthesis of Eastern Wisdom And Western Science

By
Dr. FRITJOF CAPRA

1983
BHARATIYA VIDYA BHAVAN
Kulapati Munshi Marg
Bombay-400 007

Digitization by Hindu-Heritage Foundation of America. HHFA(USA)
All Rights Reserved

First Edition, 1983

Price Rs. 10/-

PRINTED IN INDIA

By V. Varadarajan at Associated Advertisers & Printers, 505, Tardeo Arthur Road, Bombay-400 034, and Published by S. Ramakrishnan, Executive Secretary, Bharatiya Vidya Bhavan, Kulapati Munshi Marg, Bombay-400 007

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)

KULAPATI'S PREFACE

THE Bharatiya Vidya Bhavan—that Institute of Indian Culture in Bombay— needed a Book University, a series of books which, if read, would serve the purpose of providing higher education. Particular emphasis, however, was to be put on such literature as revealed the deeper impulsion of India. As a first step, it was decided to bring out in English 100 books, 50 of which were to be taken in hand almost at once.

It is our intention to publish the books we select, not only in English, but also in the following Indian languages: Hindi, Bengali, Gujarati, Marathi, Tamil, Telugu, Kannada and Malayalam.

This scheme, involving the publication of 900 volumes, requires ample funds and an all-India organisation. The Bhavan is exerting its utmost to supply them.

The objectives for which the Bhavan stands are the reintegration of the Indian culture in the light of modern knowledge and to suit our present-day needs and the resuscitation of its fundamental values in their pristine vigour.

Let me make our goal more explicit:

We seek the dignity of man, which necessarily implies the creation of social conditions which would allow him freedom to evolve along the lines of his own temperament and capacities; we seek the harmony of individual efforts and social relations, not in any makeshift way, but within the frame-work of the Moral Order; we seek the creative art of life, by the alchemy of which human limitations are progressively transmuted, so that man may become the instrument of God, and is able to see Him in all and all in Him.

The world, we feel, is too much with us. Nothing would uplift or inspire us so much as the beauty and aspiration which such books can teach.

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA

In this series, therefore, the literature of India, ancient and modern, will be published in a form easily accessible to all. Books in other literatures of the world, if they illustrate the principles we stand for, will also be included.

This common pool of literature, it is hoped, will enable the reader, eastern or western, understand and appreciate currents of world thought, as also the movements of the mind in India, which, though they flow through different linguistic channels, have a common urge and aspiration.

Fittingly, the Book University's first venture is the *Mahabharata,* summarised by one of the greatest Indians, C. Rajagopalachari; the second work is on a section of it, the *Gita* by H. V. Divatia, an eminent jurist and a student of philosophy. Centuries ago, it was proclaimed of the *Mahabharata.* "What is not in it, is nowhere". After twenty-five centuries, we can use the same words about it. He who knows it not, knows not the heights and depths of the soul; he misses the trials and tragedy and the beauty and grandeur of life.

The *Mahabharata* is not a mere epic; it is a romance, telling the tale of heroic men and women and of some who were divine; it is a whole literature in itself, containing a code of life, a philosophy of social and ethical relations and speculative thought on human problems that is hard to rival; but above all, it has for its core the *Gita,* which is, as the worlds is beginning to find out, the noblest of scriptures and the grandest of sagas in which the climax is reached in the wondrous Apocalypse in the Eleventh Canto.

Through such books alone the harmonies underlying true culture, I am convinced, will one day reconcile the disorders of modern life.

I thank all those who have helped to make this new branch of the Bhavan's activity successful.

K. M. Munshi

Digitization by Hindu-Heritage-Foundation of Americå. HHFA(USA)

INTRODUCTION

It is a great pleasure and a great honour for me to deliver the Sri Aurobindo Memorial Lectures, and I would like to express my gratitude to the University Grants Commission and to the University of Bombay for inviting me.

My gratitude on my first visit to India extends to all of you and to your country as a whole. Indian culture has deeply affected my life and has helped me enormously in my spiritual development. I came in contact with it fifteen years ago when I first read the Gita, and ever since that time I have been deeply moved by India's religious texts, her music, the stone sculptures of her ancient temples, her dance, the metaphors, symbols and images of her spiritual traditions, and by the beauty and grace of her people. To come to India and lecture here is, therefore, an event of great significance in my life, and I hope that I will be able to repay some of my debt by communicating some insights that emerged from my contacts with Indian culture, which may help to facilitate the interaction and cooperation between East and West.

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)

ACKNOWLEDGEMENT

We are grateful to the University of Bombay for granting us permission to print in book form the three lectures delivered by Dr. Fritjof Capra under the Sri Aurobindo Memorial Lectureship Endowment for the year 1980 in the University of Bombay, on behalf of the University Grants Commission.

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)

CONTENTS

		Page
	Kulapati's Preface	v
	Introduction	vii
LECTURE		
I	Parallels Between Modern Physics and Eastern Mysticism ..	1
II	The Systems View of Life ..	17
III	Social And Cultural Implications ..	30

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)

LECTURE I

PARALLELS BETWEEN MODERN PHYSICS AND EASTERN MYSTICISM

Crisis and Transformation

I am a physicist, and my main interest over the past fifteen years has been in the dramatic change of concepts and ideas that has occurred in physics during the first three decades of the century, which is still being elaborated in our current theories of matter. The new concepts in physics have brought about a profound change in our world view; from the mechanistic world view of Descartes and Newton to a holistic and ecological view, a view that turns out to be very similar to the views of mystics of all ages and traditions.

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA

The new view of reality was by no means easy to accept for physicists at the beginning of the century. The exploration of the atomic and subatomic world brought them in contact with a strange and unexpected reality. In their struggle to grasp this new reality, scientists became painfully aware that their basic concepts, their language, and their whole way of thinking were inadequate to describe atomic phenomena. Their problems were not merely intellectual but amounted to an intense emotional and, one could say, even existential crisis. It took them a long time to overcome this crisis, but in the end they were rewarded with deep insights into the nature of matter and its relation to the human mind.

I have come to believe that today the nations and societies around the world find themselves in a similar crisis. We can read about its numerous manifestations every day in the newspapers. Most of our economies produce high inflation and unemployment, with undiminishing levels of poverty and starvation; there is an energy crisis, a crisis in health care, an environmental crisis, a rising wave of violence and crime, and so on. I believe that these are all different facets of one and the same crisis, and that this crisis is essentially a crisis of perception. Like the crisis in physics in the 1920s, it derives from the fact that we are trying to apply the concepts of an outdated world view — the mechanistic world view of Cartesian-Newtonian science — to a reality which can no longer be understood in terms of these concepts.

Although the Cartesian world view is characteristic of Western rather than Eastern culture, many of its basic principles are now also applied in the East, due to the world-wide adoption of Western science and technology.

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)

The Cartesian world view has now reached its limitations in many fields—physics, biology, medicine, psychology, economics, and others. We live today in a globally interconnected world, in which biological, psychological, social and environmental phenomena are all interdependent. To describe this world appropriately we need an ecological perspective which the Cartesian world view does not offer.

What we need, then, is a new "paradigm" — a new vision of reality; a fundamental change in our thoughts, perceptions and values. The beginnings of this change, of the shift from the mechanistic to the holistic conception of reality, are already visible in all fields and are likely to dominate the entire decade. The gravity and global extent of our crisis indicate that the current changes are likely to result in a transformation of unprecedented dimensions, a turning point for the planet as a whole.

In these lectures, I shall explore various aspects of the current paradigm shift and cultural transformation. In the first lecture, I shall describe the dramatic changes that have occurred in modern physics and the new concepts that have emerged over the past decades. The new concepts of physics will be seen to be strikingly similar to the views held in mystical traditions, and especially in the spiritual traditions of India. In the second lecture I shall discuss present attempts to extend the holistic and ecological view of physics to other fields; in particular, I shall describe the emerging systems view of life, mind, consciousness and evolution. Again, we shall see that the basic concepts in these new approaches to biology and psychology closely parallel the basic ideas in spiritual traditions. The study of living matter and of the mind from this perspective will also reveal the underlying reasons for the fundamental

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA

harmony between modern Western science and ancient Eastern wisdom. In the third lecture, finally, I shall discuss the social and cultural implications of the synthesis of Eastern wisdom and Western science.

The Western World View

Before discussing the new concepts of physics and their similarities to the basic ideas in spiritual traditions, let me briefly describe the view that was changed by modern physics, i.e. the view of classical physics or, you might say, the traditional Western world view. This had been a mechanistic view of the world. It had its roots in the philosophy of the Greek atomists of the fifth century B.C. — Democritus, Leucippus and others. These philosophical schools saw matter as being made of several "basic building blocks," the atoms, which are purely passive and intrinsically dead. They were thought to be moved by some external force, which was often assumed to be of spiritual origin, and thus fundamentally different from matter.

This image became an essential part of the Western way of thinking. It gave rise to the dualism between spirit and matter, between the mind and the body, which is characteristic of Western thought. This dualism was formulated in its sharpest form in the seventeenth century in the philosophy of Descartes. Descartes based his view of nature on a fundamental division into two separate and independent realms: that of mind and that of matter. The material universe was a machine and nothing but a machine. Nature worked according to mechanical laws, and everything in the material world could be explained in terms of the arrangement and movement of its parts. Descartes extended this mechanistic view of matter to living

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)

organisms. Plants and animals were considered simply machines; human beings were inhabited by a rational soul, but the human body was indistinguishable from an animal-machine.

The essence of Descartes' approach to knowledge was his analytic method of reasoning. It consists in breaking up thoughts and problems into pieces and arranging these in their logical order. This approach has become an essential characteristic of modern scientific thought and has proved extremely useful in the development of scientific theories and the realization of complex technological projects. On the other hand, overemphasis on the Cartesian method has led to the fragmentation that is characteristic of both our general thinking and our academic disciplines, and to the widespread attitude of reductionism in science — the belief that *all* aspects of complex phenomena can be understood by reducing them to their constituent parts.

The conceptual framework created by Descartes was completed triumphantly by Newton who developed a consistent mathematical formalism of the mechanistic view of nature. From the second half of the seventeenth century to the end of the nineteenth the Newtonian model of the universe dominated all scientific thought. The natural sciences, as well as the humanities and social sciences, all accepted the mechanistic view of classical physics as the correct description of reality and modelled their own theories accordingly.

The Eastern View

In contrast to the mechanistic view, the Eastern view of the world could be called organic, holistic, or ecological.

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA

For the Eastern mystic, all things and phenomena we perceive with our senses are interrelated, are connected, and are but different aspects or manifestations of the same ultimate reality. Our tendency to divide the perceived world into individual and separate things and to experience ourselves as isolated egos in this world is seen as an illusion which comes from our measuring and categorising mentality. It is called *avidya* in Buddhist philosophy and is seen as the state of a disturbed mind which has to be overcome. Thus Ashvaghosha:

> When the mind is disturbed, the multiplicity of things is produced, but when the mind is quieted, the multiplicity of things disappears.

The division of nature into separate objects is, of course, useful and necessary to cope with our everyday environment, but it is not a fundamental feature of reality. For the Eastern mystic, any such objects have a fluid and ever changing character. The Eastern world view is a dynamic world view which contains time and change as essential features.

The dynamic nature of reality was one of the basic insights of natural philosophers also in the West, at the very dawn of science. The aim of the early Greek philosophers in the sixth century B.C. was to discover the essential nature of all things, which they called *phusis*. The Indo-European root of this word, from which our modern term "physics" is derived, is the verb *bheu*, "to grow." This Indo-European verb is also the root of the Sanskrit *brahman* which also denotes the essential nature of all things. Thus we see that the ancient sages, both in the East and in the West, saw the essence of reality in terms

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)

of growth, movement, and changes. In the view of mystics, the cosmos is seen as one inseparable reality which is forever in motion, alive, organic, spiritual and material at the same time. I shall now try to show how the main features of this picture appear in modern physics.

Atomic Physics

At the beginning of our century, the experimental investigation of atoms gave sensational and totally unexpected results. Far from being the hard and solid particles they were believed to be since antiquity, the atoms turned out to consist of vast regions of empty space in which extremely small particles — the electrons — moved around the nucleus. When quantum theory, the theoretical foundation of atomic physics, was worked out in the 1920s it became clear that even the subatomic particles, i.e. the electrons and the protons and neutrons in the nucleus, were nothing like the solid objects of classical physics. The subatomic units of matter are very abstract entities. Depending on how we look at them, they appear sometimes as particles, sometimes as waves. This dual aspect of matter was extremely puzzling. The picture of a wave which is always spread out in space is fundamentally different from the particle picture which implies a sharp location.

The apparent contradiction between the two pictures was finally solved in a completely unexpected way which gave a blow to the very foundation of the mechanistic world view, to the concept of the reality of matter. At the subatomic level, matter does not exist with certainty in definite places, but rather shows "tendencies to exist." These tendencies are expressed, in quantum theory, as probabilities and the corresponding mathematical quantities take the form

Digitization by Hindu-Heritage Foundation of America. HHFA(USA

of waves, i.e. they are similar to the mathematical forms used to describe, say, a vibrating sitar string, or a sound wave. This is why particles can be waves at the same time. They are not "real" three-dimensional waves like sound waves or water waves. They are "probability waves," abstract mathematical quantities with all the characteristic properties of waves which are related to the probabilities of finding the particles at particular points in space and at particular times.

At the atomic level, then, the solid material objects of classical physics dissolve into wave-like patterns of probabilities. These patterns, ultimately, do not represent probabilities of things but rather probabilities of interconnections. A careful analysis of the process of observation in the atomic physics shows that the subatomic particles have no meaning as isolated entities, but can only be understood as interconnections between processes of observation and measurement. For a physicist, a subatomic particle is not a thing but an interconnection beween things, and these "things," in turn, are interconnections between other things, and so on.

Atomic physics thus reveals a basic oneness of the universe. It shows that we cannot decompose the world into independently existing smallest units. As we penetrate into matter, nature does not show us any isolated basic building blocks, but rather appears as a complicated web of relations between the various parts of a unified whole. In the words of Werner Heisenberg, one of the founders of quantum theory,

> The world thus appears as a complicated tissue of events, in which connections of different kinds alternate or overlap or combine and thereby determine the texture of the whole.

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)

This, however, is very much the way in which Eastern mystics experience the world. Take, for example, the following statement by Sri Aurobindo:

> The material object becomes ... something different from what we now see, not a separate object on the background or in the environment of the rest of nature but an indivisible part and even in a subtle way an expression of the unity of all that we see.

As another example, let me quote Henry Stapp, an atomic physicist:

> An elementary particle is not an independently existing unanalyzable entity. It is, in essence, a set of relationships that reach outward to other things.

Compare this with Nagarjuna:

> Things derive their being and nature by mutual dependence and are nothing in themselves.

The Restlessness of Matter

The fact that matter, at the atomic level, appears as particles and as wave patterns implies not only an essential interconnectedness of all phenomena, but also a very peculiar behaviour of subatomic particles. Whenever they are confined to some region in space, they react to this confinement by moving around. The smaller the region of confinement, the faster the particle "jiggles" around in it. This is a typical "quantum effect," a feature of the subatomic world which has no macroscopic analogy — the more you confine a particle, the faster it moves around.

This implies, however, that atomic and subatomic matter is fundamentally "restless." Most of the material

Digitization by Hindu-Heritage Foundation of America. HHFA(USA

particles are confined by the molecular, atomic and nuclear structures, and, therefore, they have an inherent tendency to move about. According to quantum theory, matter is never quiescent, but always in a state of motion. Macroscopically, the material objects around us may seem passive and inert, but when we magnify such a "dead" piece of stone or metal, we see that it is full of activity. The closer we look at it, the more alive it appears. All the material objects in our environment are made of atoms which link up with each other in various ways to form an enormous variety of molecular structures, and these structures are not rigid and motionless but vibrate according to their temperature and in harmony with the thermal vibrations of their environment. In the vibrating atoms, the electrons are bound to the atomic nuclei by electric forces which try to keep them as close as possible, and they respond to this confinement by whirling around extremely fast. In the nuclei, finally, the protons and neutrons are pressed into a minute volume by the strong nuclear forces, and consequently they race about with unimaginable velocities.

Modern physics thus pictures matter not at all as passive and inert, but as being in a continuous dancing and vibrating motion whose rhythmic patterns are determined by the molecular, atomic, and nuclear structures. But this is also the way in which the Eastern mystics see the material world. They all emphasize that the universe has to be grasped dynamically, as it moves, vibrates and dances. For example, the dynamic world view lies at the very root of Buddhism, as S. Radhakrishnan explains in the following words:

> A wonderful philosophy of dynamism was formulated by Buddha 2,500 years ago. ... Impressed with

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)

> the transitoriness of objects, the ceaseless mutation and transformation of things, Buddha formulated a philosophy of change. He reduces ... things to forces, movements, sequences and processes, and adopts a dynamic conception of reality.

Relativity Theory

Let me now move on from quantum theory to the second basic theory of modern physics, Einstein's theory of relativity. Relativity theory, which has to be applied whenever we deal with high velocities (velocities close to the speed of light), has brought about a drastic change in our concepts of space and time. It showed us that space is not three-dimensional and that time is not a separate entity. Both are intimately and inseparably connected and form a four-dimensional continuum called "space-time". In relativity theory, therefore, we can never talk about space without talking about time, and vice versa. We have now been living with relativity theory for over 75 years and we have become thoroughly familiar with its mathematical formalism. Nevertheless, we have no direct sensory experience of the four-dimensional space-time, and, therefore, we find it very hard to deal with the concepts of "relativistic" physics at the level of intuition and ordinary language.

A similar situation seems to exist in Eastern mysticism. Mystics seem to be able to attain non-ordinary states of consciousness in which they transcend the three-dimensional world of everyday life to experience a higher, multi-dimensional reality. Thus Aurobindo speaks about "a subtle change which makes the sight see in a sort of fourth dimension." Like the reality of relativity theory, the

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA

multi-dimensional reality of meditative experience is almost impossible to describe in ordinary language.

The dimensions of these states of consciousness may not be the same as the ones we are dealing with in relativistic physics, but it is striking that they have led mystics to notions of space and time that are very similar to those implied by relativity theory. Throughout Eastern mysticism, there seems to be a strong intuition for the "space-time" character of reality. The fact that space and time are inseparably linked, which is so characteristic of relativistic physics, is emphasized again and again. For example, the Japanese scholar D.T. Suzuki writes the following about Mahayana Buddhism:

> The significance of the Avatamsaka and its philosophy is unintelligible unless we once experience ... a state of complete dissolution where there is no more distinction between mind and body, subject and object. ... We look around and perceive that ... every object is related to every other object ... not only spatially but temporally. ... As a fact of pure experience, there is no space without time, no time without space.

In physics, the concepts of space and time are so basic for the description of natural phenomena that their modification entails a modification of the whole framework we use to describe nature. The most important consequence of this modification is the realization that mass is nothing but a form of energy, that even an object at rest has energy stored in its mass.

These developments — the unification of space and time and the equivalence of mass and energy — have had a

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)

profound influence on our picture of matter and have forced us to modify our concept of a particle in an essential way. In modern physics, mass is no longer associated with a material substance, and hence particles are not seen as consisting of any basic "stuff," but as bundles of energy. Energy, however, is associated with activity, with processes, and this implies that the nature of subatomic particles is intrinsically dynamic.

To understand this better, we must remember that these particles can only be pictured within the framework of relativity theory where space and time are fused into a four-dimensional continuum. In such a framework, the particles can no longer be pictured as static three-dimensional objects, like billiard balls or grains of sand, but must be conceived as four-dimensional entities in space-time. Their forms have to be understood dynamically, as forms in space and time. Subatomic particles are dynamic patterns which have a space aspect and a time aspect. Their space aspect makes them appear as objects with a certain mass, their time aspect as processes involving the equivalent energy. Relativity theory thus gives the constituents of matter an intrinsically dynamic aspect. The particles of the subatomic world are not only active by moving around very fast; they themselves are processes! The being of matter and its activity cannot be separated. They are but different aspects of the same space-time reality.

The Cosmic Dance

The most spectacular aspect of this space-time world of subatomic physics is the creation and destruction of material particles. Mass is a form of energy, and as such

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA

it is not indestructible but can be transformed into other forms of energy. This can happen when subatomic particles collide with one another. In such collisions particles can be destroyed and the energy contained in their masses can be distributed among the other particles participating in the collision. On the other hand, when particles collide with very high velocities, their energy of motion can be used to form the masses of newly created particles. These phenomena can only be understood if the relativistic view of matter is adopted, where particles are seen as dynamic patterns, which involve a certain amount of energy appearing to us as their masses. In a collision, the total energy of the colliding particles is redistributed to form a new pattern, and this pattern may involve additional particles.

High-energy collisions of subatomic particles are the principal method used by physicists to study the properties of these particles, and particle physics is, therefore, also called high-energy physics. The energies required for the collision experiments are achieved by means of huge particle accelerators in which protons and electrons are sent round a circular track and accelerated to velocities near the speed of light, and then made to collide with other protons or with neutrons.

The creation and destruction of particles, therefore, is produced artificially, in the laboratory. In most natural phenomena here on Earth, the energies are not high enough for massive particles to be created. In outer space, however, the situation is entirely different. Subatomic particles occur in large numbers in the centre of the stars where collision processes similar to the ones studied in the accelerator laboratories take place naturally all the time. As a consequence, the stars radiate energy; mostly in the form

Digitization by Hindu-Heritage Foundation of America. HHFA(USA)

of electromagnetic radiation, but also in the form of so-called "cosmic rays," consisting of massive particles of all kinds.

When these cosmic rays hit the atmosphere of the Earth, they collide with the atoms of the atmosphere's air. Thus, the same phenomena that can be observed in the collision experiments of high-energy physics occur naturally but more intensely all the time in the Earth's atmosphere; a ceaseless flow of energy; a dynamic interplay in which particles are created and destroyed without end in a continual variation of energy patterns. The whole universe is thus engaged in endless motion and activity, in a rhythmic dance of creation and destruction.

The ideas of rhythm and dance naturally come into mind when one tries to imagine the flow of energy going through the patterns that make up the particle world. Modern physics shows us that movement and rhythm are essential properties of matter; that all matter, whether here on Earth or in outer space, is involved in a continual cosmic dance.

The Eastern mystics have a dynamic view of the universe similar to that of modern physics, and consequently it is not surprising that they, too, have used the image of the dance to convey their intuition of nature. The metaphor of the cosmic dance has found its most beautiful expression in India in the image of Shiva Nataraj. The great Indian scholar Coomaraswami expressed it beautifully:

> In the night of Brahman, Nature is inert, and cannot dance till Shiva wills it: He rises from his rapture, and dancing sends through inert matter pulsing waves of awakening sound, and lo! matter also dances,

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA

appearing as a glory round about Him. Dancing, He sustains its manifold phenomena. In the fullness of time, still dancing, He destroys all forms and names by fire and gives new rest. This is poetry, but none the less science.

For the modern physicist, the dance of Shiva is the dance of subatomic matter. As in Hindu mythology, it is a continual dance of creation and destruction involving the whole cosmos; the basis of all existence and of all natural phenomena. The metaphor of the cosmic dance thus unifies ancient mythology, religious art, and modern physics. It is indeed, as Coomaraswami said, "poetry, but none the less science."

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)

LECTURE II

THE SYSTEMS VIEW OF LIFE

The New Paradigm

In my first lecture I began to describe the new vision of reality that emerged in physics at the beginning of the century and is now emerging in various other fields. The material world, according to contemporary physics, is not a mechanical system made of separate objects, but rather appears as a complex web of relationships. Subatomic particles cannot be understood as isolated, separate entities but have to be seen as interconnections, or correlations, in a network of events. The notion of separate objects is an idealisation which is often very useful but has no fundamental validity. All such objects are patterns in an inseparable cosmic process, and these patterns are intrinsically dynamic.

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA

Subatomic particles are not made of any material substance. They have a certain mass but this mass is a form of energy. Energy, however, is always associated with processes, with activity; it is a measure of activity. Subatomic particles, then, are bundles of energy, or patterns of activity.

The energy patterns of the subatomic world form stable atomic and molecular structures which build up matter and give it its macroscopic solid appearance, thus making us believe that it is made of some material substance. At the everyday, macroscopic level the notion of a substance is quite useful, but at the atomic level it no longer makes sense. Atoms consist of particles and these particles are not made of any material stuff. When we observe them, we never see any substance; what we observe are dynamic patterns continually changing into one another — a continuous dance of energy.

The world view of modern physics is holistic and ecological. It emphasizes the fundamental interrelatedness and interdependence of all phenomena, and also the intrinsically dynamic nature of physical reality. I have shown in the first lecture that such a view comes very close to the views of mystics of all ages and traditions, and in particular to the views of the spiritual traditions of India. The parallels between modern science and ancient wisdom will emerge again in this lecture, when I shall describe the extension of the holistic and ecological world view to the study of living organisms.

The Systems View of Life

Over the last ten years, a framework has been developed which seems to be a natural extension of the concepts

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)

of modern physics. This framework is known as systems theory, sometimes also called general systems theory. Actually, the term "systems theory" is somewhat misleading, since it is not a well-defined theory, like relativity theory or quantum theory. It is rather a particular approach, a language, a particular perspective.

The systems view looks at the world in terms of relationships and integration. Systems are integrated wholes whose properties cannot be reduced to those of smaller units. Instead of concentrating on basic building blocks or basic substances, the systems approach emphasizes basic principles of organization. Examples of systems abound in nature. Every organism — from the smallest bacterium through the wide range of plants and animals to humans — is an integrated whole and thus a living system. Cells are living systems, and so are the various tissues and organs of the body, the human brain being the most complex example. But systems are not confined to individual organisms and their parts. The same aspects of wholeness are exhibited by social systems — such as a family or a community — and by ecosystems that consist of a variety of organisms and inanimate matter in mutual interaction.

All these natural systems are wholes whose specific structures arise from the interactions and interdependence of their parts. Systemic properties are destroyed when a system is dissected, either physically or theoretically, into isolated elements. Although we can discern individual parts in any system, the nature of the whole is always different from the mere sum of its parts.

Another important aspect of systems is their intrinsically dynamic nature. Their forms are not rigid structures

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA

but are flexible yet stable manifestations of underlying processes. Systems thinking is process thinking; form becomes associated with process, interrelation with interaction, and opposites are unified through oscillation. The emergence of organic patterns is fundamentally different from the consecutive stacking of building blocks, or the manufacture of a machine product in precisely programmed steps. Nevertheless, it is important to realize that these operations, too, take place in living systems. Although they are of a more specialized and secondary nature, machine-like operations occur throughout the living world. The reductionist description of organisms can therefore be useful and may in some cases be necessary. It is dangerous only when it is taken to be the complete explanation. Reductionism and holism, analysis and synthesis, are complementary approaches that, used in proper balance, help us obtain a deeper knowledge of life.

An important aspect of living systems is their tendency to form multi-levelled structures of systems within systems. For example, the human body contains organ systems composed of several organs, each organ being made up of tissues and each tissue made up of cells. All these are living organisms, or living systems, which consist of smaller parts and, at the same time, act as parts of larger wholes. Living systems, then, exhibit a stratified order, and there are interconnections and interdependencies between all systems levels, each level interacting and communicating with its total environment.

Self-organization

We see that the systems view is an ecological view. Like the view of modern physics, it emphasizes the inter-

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)

relatedness and interdependence of all phenomena and the dynamic nature of living systems. All structure is seen as a manifestation of underlying processes, and living systems are described in terms of patterns of organization.

What, then, are the patterns of organization that are characteristic of life? They include a variety of processes and phenomena which can be seen as different aspects of the same dynamic principle, the principle of self-organization. A living organism is a self-organizing system, which means that its order in structure and function is not imposed by the environment but is established by the system itself. Self-organizing systems exhibit a certain degree of autonomy; for example, they tend to establish their size according to internal principles of organization, independent of environmental influences. This does not mean that living systems are isolated from their environment; on the contrary, they interact with it continually, but this interaction does not determine their organization.

The relative autonomy of self-organizing systems sheds new light on the age-old philosophical question of free will. From the systems point of view, both determinism and freedom are relative concepts. To the extent that a system is autonomous from its environment it is free; to the extent that it depends on it through continuous interaction its activity will be shaped by environmental influences. The relative autonomy of organisms usually increases with their complexity, and it reaches its culmination in human being.

This relative concept of free will seems to be perfectly consistent with the view of mystical traditions that exhort their followers to transcend the notion of an isolated self and become aware that we are inseparable parts of the

Digitization by Hindu Heritage Foundation of America. HHFA(USA

cosmos in which we are embedded. The goal of these traditions is to shed all ego sensations completely and, in mystical experience, merge with the totality of the cosmos. Once such a state is reached, the question of free will seems to lose its meaning. If I *am* the universe, there can be no "outside" influences and all my actions will be spontaneous and free. As the Tibetan Buddhist Lama Govinda has put it:

> To the enlightened man .'. whose consciousness embraces the universe, to him the universe becomes his "body," while his physical body becomes a manifestation of the Universal Mind, his inner vision an expression of the highest reality, and his speech an expression of eternal truth and mantric power.

From the point of view of mystics, therefore, the notion of free will is relative, limited and illusory, like all other concepts we use in our rational descriptions of reality.

Self-maintenance and Self-transcendence

A theory of self-organizing systems has been worked out over the last decade in considerable detail by a number of researchers from various disciplines under the leadership of the Belgian Nobel laureate Ilya Prigogine. One of the most important characteristics of self-organization is the fact that self-organizing systems are "always at work." They have to maintain a continuous exchange of energy and matter with their environment to stay alive. This exchange involves taking in ordered structures, such as food, breaking them down and using some of the components to maintain or even increase the order of the organism. This process is known as metabolism.

Digitization by Hindu Heritage Foundation of America. HHFA (USA)

Another important aspect of the continual activity of living systems is the process of self-renewal. Every living organism continually renews itself, cells breaking down and building up structures, tissues and organs replacing their cells in continual cycles. In spite of this continual change, the organism maintains its overall structure and appearance. Its components are continually renewed and recycled, but the pattern of organization remains stable. Other aspects of self-organization which are closely related to self-renewal are the phenomena of self-healing, regeneration, and adaptation to environmental changes.

The phenomenon of self-renewal, together with that of stratified order, provides us with the proper perspective on the phenomenon of death. Self-renewal — the breaking down and building up of structures in continual cycles — is an essential aspect of living systems. But the structures that are continually being replaced are themselves living organism. From their point of view the self-renewal of the larger system is their own cycle of birth and death. Birth and death, therefore, now appear as a central aspect of self-organization, the very essence of life. Death, then, is not the opposite of life but an essential aspect of it. Again, this view is in perfect harmony with that of Eastern spiritual traditions, in which birth and death are seen as stages of endless cycles that represent the continual self-renewal characteristic of the dance of life.

The aspects of self-organization I have described so far can all be seen as processes of self-maintenance. What makes the understanding of living systems quite difficult is the fact that they have not only a tendency to maintain themselves in their dynamic state but, at the same time, also show a tendency to transcend themselves, to reach out

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA

creatively beyond their boundaries and limitations to generate new structures and new forms of organization. This principle of self-transcendence manifests itself in the processes of learning, development, and evolution.

According to the systems view, the Darwinian theory of evolution represents only one of two complementary views which are both necessary to understand the phenomenon of evolution. The other view sees evolution as an essential manifestation of self-organization which leads over time to an ordered unfolding of complexity. The two complementary tendencies of self-organizing systems — self-maintenance and self-transcendence — are in continual dynamic interplay and both of them contribute to the phenomenon of evolutionary adaptation.

A New Concept of Mind

In order to apply the systems view of life to higher organisms and, in particular, to human beings, it is necessary to deal with the phenomenon of mind. The anthropologist and systems theorist Gregory Bateson has proposed to define mind as a systems phenomenon characteristic of living organisms, societies and ecosystems. He has listed a set of criteria which systems have to satisfy for mind to occur. Any system that satisfies those criteria will be able to process information and develop various phenomena which we associate with mind — thinking, learning, memory, etc. In Bateson's view, mind is a necessary and inevitable consequence of a certain complexity which begins long before organisms develop a brain and a higher nervous system.

Bateson's criteria for mind turn out to be closely related to the characteristics of self-organizing systems. Indeed,

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)

mind is an essential property of living systems. From the systems point of view, life is not some substance or force, and mind is not an entity interacting with matter. Both life and mind are manifestations of the same set of systemic properties; a set of processes which represent the dynamics of self-organization.

The new concept of mind will be of tremendous value for Western science to overcome the Cartesian division. Mind and matter no longer appear to belong to two separate categories, but can be seen to represent merely different aspects of the same phenomenon. For example, the relationship between mind and brain, which has confused countless scientists ever since Descartes, becomes now quite clear. Mind is the dynamics of self-organization, and the brain is the biological structure through which this dynamics is carried out.

I shall follow Bateson completely in his concept of mind, but shall use a slightly different language. I shall reserve the term "mind" for organisms of high complexity and will use "mentation," a term meaning mental activity, to describe the dynamics of self-organization at lower levels. Every living system — a cell, a tissue, an organ, etc. — is engaged in the process of mentation, but in higher organisms an "inner world" unfolds which is characteristic of mind. It includes self-awareness, conscious experience, conceptual thought, symbolic language, etc. Most of these characteristics exist in rudimentary form in various animals, but they unfold fully in human beings.

The fact that the living world is organized in multi-levelled structures means that there also exist levels of mind. In the human organism, for example, there are various levels of "metabolic" mentation involving cells, tissues, and

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA

organs, and then there is the neural mentation of the brain which, itself, consists of multiple levels corresponding to different stages of human evolution. The totality of these mentations constitutes what I would call the human mind, or psyche. In the stratified order of nature, individual human minds are embedded in the larger minds of social and ecological systems and these are integrated into the planetary mental system, which in turn must participate in some kind of universal or cosmic mind.

It is evident that such a view of mind comes very close to the views in spiritual traditions. The concept of stratified order plays a prominent role in many traditions. As in modern science, it involves the notion of multiple levels of reality which differ in their complexities and are mutually interacting and interdependent. These levels include levels of mind which are seen as different manifestations of cosmic consciousness.

Views of Consciousness

This brings me to my last topic in this lecture, the nature of consciousness — a fundamental existential question that has fascinated men and women throughout the ages. To facilitate the discussion of this important subject, let me first clarify my terms. I use the term "consciousness" in the sense of self-awareness. Awareness is a property of mentation at any level, from single cells to human beings, but self-awareness emerges only at high levels of complexity and unfolds fully in human beings. We are not only aware of our sensations, but also of ourselves as thinking and experiencing individuals. It is this property of mind, which emerges together with the "inner world", that I shall mean by consciousness.

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)

Most theories about the nature of consciousness seem to be variations on either of two opposing views that may nevertheless be complementary and reconcilable in the systems approach. One of these views may be called the Western scientific view. It considers matter as primary and consciousness as a property of complex material patterns that emerges at a certain stage of biological evolution. The other view of consciousness may be called the mystical view, since it is generally held in mystical traditions. It regards consciousness as the primary reality and ground of all being. In its purest form consciousness, according to this view, is non-material, formless, and void of all content; it is often described as "pure consciousness." "ultimate reality," "suchness," and the like. This manifestation of consciousness is associated with the Divine in many spiritual traditions. It is said to be the essence of the universe and to manifest itself in all things; all forms of matter and all living beings are seen as patterns of divine consciousness.

The mystical view of consciousness is based on the experience of reality in non-ordinary modes of awareness, which are traditionally achieved through meditation. Modern psychologists have come to call non-ordinary experiences of this kind "transpersonal" because they seem to allow the individual mind to make contact with collective and even cosmic mental patterns. There is now a whole school of Western psychology, called transpersonal psychology, which is concerned with the recognition, understanding, and realization of non-ordinary states of consciousness, and with the psychological conditions that represent barriers to such transpersonal realizations. The concerns of this new school of psychology are thus very close to those of spiritual traditions, and, indeed, a number of transpersonal psychologists are

Digitization by Hindu Heritage Foundation of America. HHFA(USA

working on conceptual systems intended to bridge and integrate psychology and the spiritual quest.

According to numerous testimonies, transpersonal experiences involve a strong, personal, and conscious relation to reality that goes far beyond the present scientific framework. We should, therefore, not expect science, at its present stage, to confirm or contradict the mystical view of consciousness. Nevertheless, the systems view of mind seems perfectly consistent with both the scientific and the mystical views of consciousness, and thus to provide the ideal framework for unifying the two.

The systems view agrees with the conventional scientific view that consciousness is a manifestation of complex material patterns. To be more precise, it is a manifestation of living systems of a certain complexity. On the other hand, the biological structures of these systems are expressions of underlying processes that represent the system's self-organization, and hence its mind. In this sense material structures are no longer considered the primary reality. Extending this way of thinking to the universe as a whole, it is not too far-fetched to assume that all its structures — from subatomic particles to galaxies and from bacteria to human beings — are manifestations of the universe's self-organizing dynamics, which we have identified with the cosmic mind. But this is almost the mystical view, the only difference being that mystics emphasize the direct experience of cosmic consciousness that goes beyond the scientific approach. Still, the two approaches seem to be quite compatible. The systems view of nature at last seems to provide a meaningful scientific framework for approaching the age-old questions of the nature of life, mind, consciousness, and matter.

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)

Science and Spirituality

I hope that my presentation of the systems view of life has made it clear that the new vision of reality is an ecological vision in a sense which goes far beyond the immediate concerns with environmental protection. It is supported by modern science, but it is rooted in a perception of reality that goes beyond the scientific framework to an intuitive awareness of the oneness of all life, the interdependence of its multiple manifestations and its cycles of change and transformation. When the concept of the human spirit is understood as the mode of consciousness in which the individual feels connected to the cosmos as a whole, it becomes clear that ecological awareness is truly spiritual. Indeed, the idea of the individual being linked to the cosmos is expressed in the Latin root of the word religion, *religare* ("to bind strongly"), as well as in the Sanskrit *yoga,* which means union.

It is thus not surprising that the new vision of reality is consistent with many ideas in mystical traditions. The parallels between science and mysticism are not confined to modern physics but can now be extended with equal justification to biology and psychology. We can say today, with considerable confidence, that the ancient wisdom of the East provides the most consistent philosophical background to our modern scientific theories.

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA

LECTURE III

SOCIAL AND CULTURAL IMPLICATIONS

The Ecological Perspective

In my first two lectures, I have presented the new vision of reality that is now emerging from several sciences — physics, biology, psychology, and others — a vision which is dynamic, ecological, and spiritual in its very essence; a vision, furthermore, which strongly suggests a synthesis of Eastern wisdom and Western science.

This new vision of reality has many important implications not only for science and philosophy but also for society and everyday living. Since the major problems of our time are rooted in an outdated perception of reality, the new ecological perspective will profoundly affect our

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)

way of life. It will influence our ways of dealing with health and illness, our relation to the natural environment. and many of our social and political structures. For example, physicians will have to widen their perspective, seeing the human organism as a self-organizing and self-healing system which involves interdependent physical and psychological patterns: a system which is an integral part of interacting larger systems of physical, social, and cultural dimensions. The social sciences will have to deal with some of these larger systems accordingly, transcending present disciplinary boundaries and expanding their basic concepts from their narrow, reductionist connotations to a broad ecological context.

The systems view of life is an appropriate basis not only for the life sciences but also for the social sciences, and especially for economics. The application of systems concepts to describe economic processes and activities is particularly urgent because virtually all our current economic problems are systemic problems that can no longer be understood in terms of Cartesian science. Conventional economists generally lack an ecological perspective. They tend to dissociate the economy from the ecological fabric in which it is embedded, and to describe it in terms of simplistic and highly unrealistic theoretical models. Most of their basic concepts are narrowly defined and used without the pertinent ecological context, and hence are no longer appropriate for mapping economic activities in a fundamentally interdependent world.

The systems approach to economics will make it possible to bring some order into the present conceptual chaos by giving economists the urgently needed ecological perspective. According to the systems view, the economy

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA

is a living system composed of human beings and social organizations in continual interaction with one another and with the surrrounding ecosystems on which our lives depend. Like individual organisms, ecosystems are self-organizing systems, in which animals, plants, micro-organisms, and inanimate substances are linked through a complex web of interdependencies involving the exchange of matter and energy in continual cycles. Linear cause-and-effect relationships exist only very rarely in these ecosystems, nor are linear models very useful to describe the functional interdependencies of the embedded social and economic systems and their technologies.

The recognition of the nonlinear nature of all systems dynamics is the very essence of ecological awareness, the essence of "systemic wisdom". This kind of wisdom is characteristic of traditional cultures but has been sadly neglected in many modern industrial societies. Systemic wisdom is based on a profound respect for the wisdom of nature, which is totally consistent with the insights of modern ecology. Our natural environment consists of ecosystems inhabited by countless organisms which have co-evolved over billions of years, continuously using and recycling the same molecules of soil, water and air. The organizing principles of these ecosystems must be considered superior to those of human technologies based on recent inventions and, very often, on short-term linear projections.

The nonlinear interconnectedness of living systems immediately suggests two important rules for the management of social and economic systems. First, there is an optimal size for every structure, organization, and institution, and maximizing any single variable — profit, efficiency, or GNP, for example — will inevitably destroy

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)

the larger system. Second, the more an economy is based on the continual recycling of its natural resources, the more it is in harmony with the surrounding environment.

The first rule shows that the question of scale which Schumacher pioneered with the slogan "small is beautiful," will play a central role in the reorganization of our economic and social structures. The criterion of all considerations of scale has to be the comparison to human dimensions. What is too large, fast, or crowded in comparison to human dimensions is too big. Decentralization will be essential to restore ecological balance, and this will involve curbing the growth of cities, dismantling some large corporations, and redistribution of wealth within nations and between the industrialized countries and the Third World.

Soft Technologies

Return to a more human scale will not mean a return to the past but, on the contrary, will require the development of ingenious new forms of technology and social organization. Much of our conventional, resource-intensive and highly centralized technology is now obsolete. Nuclear power, petroleum-subsidized agriculture, and many other high-technology enterprises are anti-ecological, inflationary and unhealthy. Although these technologies often involve the latest discoveries in electronics, chemistry and other fields of modern science, the context in which they are developed and applied is that of the Cartesian conception of reality which is now outdated. They will have to be replaced by new forms of technology which incorporate ecological principles.

Digitization by Hindu Heritage Foundation of America. HHFA(USA

Many of these alternative technologies — "appropriate technologies", as Schumacher called them — are already being developed. They tend to be small-scale and decentralized, responsive to local conditions and designed to increase self-sufficiency, thus providing a maximum degree of flexibility. They are often called "soft" technologies because their impact on the environment is greatly reduced by using mainly renewable resources and by constant recycling of materials. Solar energy collectors, wind generators, organic farming and recycling of waste products are examples of such soft technologies. Being small-scale and decentralized, they tend to be labor-intensive, rather than resource-intensive, and thus help to alleviate unemployment and poverty while, at the same time, being environmentally benign.

The shift from hard to soft technologies is most urgently needed in the areas related to energy production. During the 1970s the world became acutely aware of a global shortage of fossil fuels, and with the inevitable decline of these conventional sources of energy in sight, the leading industrialized countries embarked on a vigorous campaign for nuclear power as an alternative energy source. The debate about how to solve the energy crisis is usually based on a very narrow view of the problem. Any realistic discussion has to take into account the roots of the present shortage of energy and their connections to the other critical problems facing us today. Such a perspective makes apparent that our ever increasing energy needs, especially in the West, reflect the general expansion of our economic and technological systems; they are caused by the patterns of undifferentiated growth that deplete our natural resources and contribute significantly to our

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)

multiple symptoms of individual and social illness. What we need to overcome our multifaceted crisis is not more energy but a profound change of values, attitudes and life styles.

However, while we pursue this long-term goal we also need to shift our energy production from non-renewable resources, and from hard to soft technologies, in order to achieve ecological balance. Unfortunately, the energy policies of most industrialized countries reflect the "hard energy path", in which energy is produced from non-renewable resources — oil, natural gas, coal, and uranium by means of highly centralized technologies that are rigidly programmed, and are uneconomical and unhealthy. Nuclear power is by far the most dangerous component of the hard energy path. It surpasses the ecological impact of large-scale energy production from coal, which is already devastating, by several orders of magnitude, threatening not only to poison our natural environment for thousands of years but even to extinguish the entire human species. Nuclear power represents the most extreme case of a technology that has got out of hand, propelled by an obsession with self-assertion and control that has reached highly pathological levels.

In describing nuclear power in such terms, I am referring to both nuclear weapons and reactors. It is an intrinsic property of nuclear technology that these two applications cannot be separated; both of them represent today the greatest threat to our survival and well-being. At the same time, nuclear power is rapidly becoming the most inefficient and uneconomical energy source and, like so many products that were recognized as being inefficient and harmful by the industrialized nations, nuclear

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA

technology is now being promoted especially in the Third World. The aim of this promotion is not to satisfy the energy needs of Third World countries, but those of multinational corporations extracting the natural resources from these countries as fast as they can. Politicians in Third World countries often welcome nuclear technology, however, because it gives them a chance to use it for building nuclear weapons.

The hazards of nuclear power are complex, multidimensional, and operate on an extremely large scale, both in space and in time. They are often not easy to understand, but a careful and comprehensive study of the total impact of nuclear technology makes it quite clear that it is unsafe, uneconomical, irresponsible, and thus totally unacceptable.

The Passage To The Solar Age

In the long run, we need an energy source that is renewable, economically efficient, and environmentally benign. Solar energy is the only kind of energy that satisfies all these criteria. The sun has been the planet's main energy source for billions of years, and life in its myriad forms has become exquisitely adapted to solar energy during the long course of planetray evolution. All the energy we use, except for nuclear power, represents some form of stored solar energy. Not all these forms of energy are renewable, however. In the current energy debate the term "solar energy" is used more specifically to refer to the forms of energy that come from inexhaustible or renewable sources. Solar energy in this sense is available in forms as varied as the planet itself. In forested areas it is present as a solid fuel (wood); in agricultural

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)

areas it can be produced as a liquid or gaseous fuel (alcohol or methane produced from plant products), in mountainous regions as hydroelectric power, and in windy places as wind-generated electricity; in sunny areas it can be collected as direct heat.

Most of these forms of solar energy have been exploited by human societies throughout the ages by means of time-honored technologies. The transition to solar energy does not require any major technological innovations. It simply involves the judicious integration of long-known agricultural and technological processes into the activities of our modern societies. Several studies have shown that the existing soft technologies are sufficient to meet all our long-term energy needs. In fact, many of them are already being used successfully by solar-conscious communities. The most efficient solar technologies involve small-scale devices, to be used by local communities, which generate a wide variety of jobs and are benign in their effect.

Several recent and authoritative studies of our energy options show that the road to a solar future is open. Although significant technological advances are to be expected in several areas, we do not have to wait for any technological breakthroughs to embark on this historic transition. What we need most is accurate public information about the potential of solar energy, along with corresponding social and economic policies to facilitate the passage to the solar age.

The Rising Culture

The transition to the solar age is under way now, not merely in terms of new technologies but, in a broader sense,

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA

as a profound transformation of many societies around the world. The shift from the mechanistic to the ecological paradigm is not something that will happen some time in the future; it is happening right now. In describing these social and cultural transformations I shall naturally adopt a European and North American perspective, but I am sure that many developments there will also be relevant to India. Our planet is now so densely populated that virtually all economic systems are thoroughly interwoven and interdependent. Hence, today's most important problems are global problems. The vital social choices we face are no longer local; they are choices between principles of self-organization — centralization or decentralization, hard technologies or soft technologies — that affect the survival of humanity as a whole.

In Europe and North America, the 1960s and 1970s generated a whole series of philosophical, spiritual, and political movements which all seem to go in the same direction; they all emphasize different aspects of the new vision of reality. There has been a proliferation of citizen movements formed around social and environmental issues, following the pioneering efforts of Ralph Nader. In recent years there has been a broad convergence of these movements and a tendency to go beyond single issues to address fundamental systemic concerns. Closely related to their efforts are the activities of a number of organizations referred to collectively as the ecology movement. These groups maintain information centers and publish newsletters on environmental protection, organic farming, recycling of waste, and other ecological concerns. Some also provide practical assistance in developing and applying soft

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)

technologies, and many of them belong to anti-nuclear alliances and coalitions.

Citizen and consumer movements are also the sources of emerging counter-economies based on decentralized, co-operative, and ecologically harmonious life styles, and involving the bartering of skills and home-produced goods and services. Interesting and significant patterns of such counter-economies have grown in this way in the United States, Canada, the United Kingdom, the Scandinavian countries, the Netherlands, Japan, Australia, and New Zealand.

Another important contribution to the reorganization of economic patterns comes from worker-participation and self-management movements, which are active in Canada and several European countries. The first successful model of worker self-management was achieved in Yugoslavia and has since inspired similar developments in Sweden, Germany, and other Western European countries. Societies around the world now have unique possibility of synthesizing and adapting to their needs the strategies of creative communities from all parts of the world — from the Chinese model of self-reliant communal development and the traditional values and life styles of numerous communities in the Third World to the Yugoslavian model of worker self-management and the informal economies that are now being developed in the United States and many other countries.

The ecology movement is developing the ecological vision of reality that I have described in some detail in these lectures; a vision which is now extending to the planetary level, supported by the powerful experience of the

Digitization by Hindu-Heritage Foundation of America. HHFA(USA

astronauts and expressed in images like "spaceship Earth" and the "Whole Earth." This new awareness is being generated by numerous individuals, groups, and networks, and a significant shift of values has been observed in Europe and North America in large sections of the general population. It is a shift from material consumption to voluntary simplicity, from economic and technological growth to inner growth and development.

The shift from material growth to inner growth is being promoted in the United States by the "human potential" movement, the "holistic health" movement, the feminist movement, and various spiritual movements. While economists have seen human needs in terms of material acquisitions and have postulated that these needs are in principle insatiable, humanistic psychologists have concentrated on non-material needs and, in doing so, have outlined a radically different image of human nature. Transpersonal psychologists have extended this image by emphasizing the value of a direct, experiential understanding of oneness with the entire human family and the cosmos at large. It is evident that the new values are in basic agreement with those of Eastern spiritual traditions and, indeed, they are supported by many spiritual movements in Europe and North America that have been inspired by the ancient wisdom of the East.

One of the most interesting cultural phenomena in the United States is the recent confluence of three powerful trends: ecology, spirituality and feminism. It seems that the spiritual essence of the ecological vision has found an ideal expression in the feminist spirituality advocated by the women's movement and based on the age-old identification of women and nature. Feminist spirituality is based

Digitization by Hindu-Heritage-Foundation of America, HHFA(USA)

on awareness of the oneness of all living forms and of their cyclical rhythms of birth and death, thus reflecting an attitude towards life that is profoundly ecological. As numerous feminist authors have pointed out, the image of a female deity seems to embody this kind of spirituality more accurately than that of a male god. Indeed, worship of the Goddess predates that of male deities in many cultures, East and West. With the renaissance of the Goddess image, the feminist movement is also creating a new self-image for women, along with new modes of thinking and a new system of values. This feminist spirituality will have a profound influence not only on religion and philosophy but also on social and political life.

Conventional stereotypic images of human nature are challenged today not only by the women's movement but also by a great number of ethnic liberation movements in revolt against the oppression of minorities through ethnic prejudice and racism. A similar questioning of authority is being initiated at the global level, as Third World countries challenge the conventional notion that they are "less developed" than the industrial countries. An increasing number of their leaders now perceive the multi-faceted crisis of the Northern Hemisphere with great clarity, and are resisting the industrialized world's attempts to export its problems to the Southern Hemisphere.

So far, most of the movements I have described still operate separately and have not yet recognized how their purposes interrelate. But several significant coalitions have recently begun to form. Women have been playing important roles in forming coalitions and alliances between various movements, which is not surprising since feminism represents today a major cultural force, especially in North America

Digitization by Hindu-Heritage Foundation of America. HHFA(USA

and Europe. In fact, it is likely that the women's movement will play a pivotal role in the coalescence of various social movements.

The new alliances and coalitions, which already interlink hundreds of groups and networks, aim to be non-hierarchical, non-bureaucratic, and non-violent. Some of them function very effectively around the world. An example of such a world-wide coalition is Amnesty International's great campaign for human rights. The multiple networks and coalitions have not yet asserted themselves decisively in the political arena, but as they continue to give substance to the new vision of reality, a critical mass of awareness will be reached that will allow them to coalesce into new political parties.

I believe that during this decade the various movements will recognize the communality of their aims and will flow together to form a powerful force of social transformation. I have called this force the rising culture, following Toynbee's persuasive model of cultural dynamics. Toynbee and other cultural historians have often pointed out that the evolution of cultures is characterized by a regular pattern of rise, culmination, decline, and disintegration. The decline will occur when a culture has become too rigid — in its technologies, ideas or social organizations — to meet the challenge of changing conditions. The loss of flexibility is accompanied by a general loss of harmony which inevitably leads to the outbreak of social discord and disruption. During this process of decline and disintegration, while the cultural mainstream has become petrified by clinging to fixed ideas and rigid patterns of behaviour, creative minorities will appear on the scene and transform some of the old elements

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)

into new configurations which become part of the new rising culture.

This pattern is now quite apparent in Europe and North America. The traditional political parties, the large multinational corporations, and most of our large academic institutions are all part of the declining culture. They are in the process of disintegration. The social movements of the 1960s and 1970s represent the rising culture, which is now ready for the passage to the solar age. While the transformation is taking place, the declining culture refuses to change, clinging ever more rigidly to its outdated ideas; nor will the dominant social institutions hand over their leading roles to the new cultural forces. But they will inevitably go on to decline and disintegrate while the rising culture will continue to rise and, eventually, will assume its leading role.

I believe that scientists, and especially physicists, can play an important role in this process of cultural transformation. Since the seventeenth century physics has been the shining example of an exact science, and has served as the model for all the other sciences. For two and a half centuries physicists have used a mechanistic view of the world to develop and refine their conceptual framework. In the twentieth century, however, physics has gone through several conceptual revolutions that clearly reveal the limitations of the mechanistic world view and lead to an organic, ecological view of the world; a view that shows great similarities to the views of mystics, and especially to the mystical traditions of the East. Physicists, therefore, can provide the scientific background to the changes in attitudes and values that the world so urgently needs. Modern physics can show the other sciences that scientific thinking does not

Digitization by Hindu-Heritage Foundation of America. HHFA(USA)

necessarily have to be reductionist and mechanistic, that holistic and ecological views are also scientifically sound. Thus scientists, businessmen and politicians will not need to be reluctant to adopt a holistic framework, as they are often today, for fear of being unscientific. Modern physics can show them that such a framework is not only in harmony with ancient wisdom but is also in agreement with the most advanced scientific theories of physical reality.

Digitization by Hindu-Heritage-Foundation of America: HHFA(USA)

Digitization by Hindu Heritage Foundation of America. HHFA(USA

BHARATIYA VIDYA BHAVAN

CONSTITUENT INSTITUTIONS

MUMBADEVI SANSKRIT MAHAVIDYALAYA
An Oriental College teaching Sanskrit and Shastras by traditional methods for Shastri and Acharya (recognised as equivalent to B.A. and M.A. respectively) and for Vachaspati (research).

SHASTRIYA SANSKRIT PARIKSHA VIBHAG
Department of Higher Sanskrit Examinations for Praveshika, Purva Madhyama, Uttara Madhyama, Shastri, Acharya and Vachaspati Examinations.

SARAL SANSKRIT PARIKSHA VIBHAG
Department of Easy Sanskrit Examinations for Balbodh, Prarambh, Pravesh, Parichay and Kovid Examinations.

GITA VIDYALAYA
An Academy for the study of Indian Culture with reference to the *Bhagavad Gita*.

MUNGALAL GOENKA INSTITUTE OF POST-GRADUATE STUDIES AND RESEARCH
A Post-graduate and Research Institute recognised by the University of Bombay for coaching students for the degrees of M.A. and Ph.D.

MUNSHI SARASWATI MANDIR
An Institute of Culture with a Library consisting of over 65,000 volumes including many Indological volumes and a museum consisting of old and valuable palm leaf manuscripts, coins, paintings, etc.

VALLABHJI RAMJI BALPUSTAKALAYA
A Library for Children with facilities for indoor games, educational films, etc.

BHARATIYA KALA KENDRA
The Kala Kendra is devoted to the development of Drama, Dance and Music and produces dramas and dance ballets in English as well as in Hindi, Gujarati, Marathi to encourage amateur talents. The Sugam Sangit Unit of the Kala Kendra popularises light music and Rabindra Sangeet. The Bhakti Sangit Unit holds bhajans, etc.

BHARATIYA SANGIT SHIKSHAPITH
An Academy of Indian Classical Music, affiliated to the Bhatkhande Sangit Vidyapith, Lucknow, which is recognised by the Central Government for courses leading to the Bachelor of Music Degree.

BHARATIYA NARTAN SHIKSHAPITH
An Academy of Dance for teaching the four systems of Indian dancing, viz., Manipuri, Kathak, Kathakali and Bharata Natyam.

BHARATIYA ITIHASA VIBHAG
Publishes THE HISTORY AND CULTURE OF THE INDIAN PEOPLE in 11 volumes. So far nine volumes have been published, viz., (1) The Vedic Age, (2) The Age of Imperial Unity, (3) The Classicdl Age, (4) The Age of Imperial Kanauj, (5) The Struggle for Empire, (6) The Delhi Sultanate, (7) British Paramountcy and Indian Renaissance Part I (8) Part II and (9) The Struggle for Freedom. The remaining volumes will follow. This is considered to be the first successful attempt by Indian scholars at writing a really comprehensive and critical account of Indian History through the ages by a team of about 70 eminent historians, each writing on subjects in which he has specialised.

BOOK UNIVERSITY
Publishes books, ancient and modern, at low price (Rs. 4/- and Rs. 3/-) to make available the best literature and classics of India and the world to the common man in an easily understandable form. So far 175 titles have been published and over 20,00,000 copies have in all been sold. Some of the books have also been published in Hindi, Marathi, Bengali and Tamil.

RUPEE SERIES
A sister series to the Book University comprising selections from the writings of eminent personalities. So far 76 titles have been published.

CULTURAL READERS
A new department for preparation of Readers for children introducing the basic culture of India, and Anthologies for Post-graduate students.

PRAKASHAN MANDIR
Apart from the HISTORY and BOOK UNIVERSITY SERIES, this department also publishes the results of the research and other activities of the various Mandirs of the Bhavan and books of cultural value. Its publications include :

Digitization by Hindu Heritage Foundation of America. HHFA(USA)

Singhi Jain Series : Critical editions of ancient works and manuscripts connected with Jain religion and literature. Published volumes 55.

The Glory that was Gurjaradesa : A comprehensive study of Gujarat in 7 volumes. Published volumes 2.

Munshi Sahitya : Social novels, historical plays, biographical works of Munshiji and Smt Lilavati Munshi in Gujarati and English, the copyright whereof has been kindly gifted by them to the Bhavan. Published volumes 128.

JOURNALS:

Bharatiya Vidya : An Indological research quarterly in English started in 1943.

Bhavan's Journal : An English Fortnightly devoted to life, literature and culture started in 1954. Annual Subscription Rs. 12.00.

Samarpan : A Gujarati Fortnightly started in 1959. Annual Subscription Rs. 6.50

Samvid : A Sanskrit Quarterly started in 1964. Annual Subscription Rs. 4.00

DEPARTMENT OF PRINTING

Bhavan's Press where all its publications and periodicals are printed and where practical training in printing is given to the students of the Bhavan's Rajendra Prasad College of Mass Communication and Media.

RAJENDRA PRASAD COLLEGE OF MASS COMMUNICATION AND MEDIA

An Institution for providing systematic instruction in Journalism, Advertising, Marketing, Public Relations and Printing.

M.M.COLLEGE OF ARTS & N. M. INSTITUTE OF SCIENCE, ANDHERI, BOMBAY

The College was opened in June 946. It is affiliated to the Bombay University for courses of studies leading to B.A., B. Sc., M.A., M.Sc. and Ph. D. degrees.

BHAVAN'S COLLEGE OF ARTS & SCIENCE, DAKOR, GUJARAT

The College was opened in June 1962. It is affiliated to the Gujarat University, for courses of studies leading to B. A., B.Sc. and B. Com. degrees.

SARDAR PATEL COLLEGE OF ENGINEERING, ANDHERI, BOMBAY

The College was opened in June 1962 for courses of studies leading to B.E. (Civil, Mechanical and Electrical) degree. It is affiliated to the Bombay University.

HAZARIMAL SOMANI COLLEGE OF ARTS & SCIENCE, CHOWPATTY, BOMBAY

The College was opened in June 1965. It is affiliated to the Bombay University for courses of studies leading to B.A. and B.Sc. degrees.

RANCHHODLAL ACHARATLAL COLLEGE OF ARTS & SCIENCE, AHMEDABAD

The College was inaugurated in June 1965. It is affiliated to the Gujarat University for courses of studies leading to B.A., B.Sc., and B. Com. degrees.

BHAVAN'S VALLABHRAM MEHTA PUBLIC SCHOOL, NEW DELHI.

The School coaches students for the Cambridge School Leaving Examination, the medium of instruction being English. Music, Indian Dancing and Painting are also taught to the students.

BHAVAN'S MAHILA MANDAL SCHOOL, ANDHERI, BOMBAY

A day school for preparing pupils for the Maharashtra Secondary School Certificate Examination.

BHAVAN'S ACADEMY OF LANGUAGES, BOMBAY, COIMBATORE, MADRAS AND NEW DELHI

The Academy teaches nine foreign languages, viz., German, Russian, French, Spanish, Arabic, Chinese, Persian, Sinhalese and Nepali.

MUNGALAL GOENKA SANSKRIT TRUST

The income from this Trust goes to support the Post-graduate and Research Department of the Bhavan.

BHAVAN'S SAMSKRITIC VIKAS YATRA

This department was constituted in 1963, its chief aim being inculcating culture-consciousness by arranging cultural tours to the various religious, historical, cultural and industrial centres of India.

BHAVAN INTERNATIONAL

This department was constituted in 1964 to maintain and develop Bhavan's contacts in different parts of the world.

BHAVAN'S VALLABHRAM MEHTA PUBLIC SCHOOL, BARODA

The School coaches students for the All-India Higher Secondary Examination, Government of India. Medium of instruction: English. Sanskrit compulsory from Std. VI.

ASSOCIATED BODIES

Sanskrit Vishva Parishad, Bharatiya Stree Seva Sangh, Bombay Astrological Society, Bombay Agri-Horticultural Society and V. S. Mehta College of Science, Bharwari (near Allahabad).

Digitization by Hindu-Heritage-Foundation of America. HHFA(USA)

ABOUT THE AUTHOR

The eminent physicist, Dr. Fritjof Capra, author of the well-known book *The Tao of Physics*, was invited to deliver the 1982 Sri Aurobindo Memorial Lectures by the University Grants Commission under the auspices of the University of Bombay.

As a physicist, Dr. Capra's main interest has been in the dramatic change in concepts and ideas in Physics which have profoundly altered world view, which is very similar to the view of mystics of all ages and traditions. As a keen student of physical science, Dr. Capra, like many other scientists, had to grapple with the emerging new concepts which almost revolutionised their scientific thinking. His contact with Eastern thinking beginning with the *Gita* enabled Dr. Capra to delve deeper into the mystical traditions of the East and share with the readers his discovery of the striking parallels between ancient Eastern thinking and 20th-century physics in his book, *The Tao of Physics*. This was followed by *The Turning Point* wherein the distinguished physicist has tried to show how the revolution in modern physics is the forerunner of an imminent revolution in all the fields and a complete transformation of our world view and values.

In the present bookt he *New Vision of Reality — A Synthesis of Eastern Wisdom and Western Science* (which contains the substance of his three lectures), Dr. Capra has developed his theories further and shown that the continuing synthesis of Eastern thinking and Western science will completely transform our world view and values, eventually ushering in an era of peace and prosperity for all.